Hazard Resilience

Question 1. How are NOAA's products and services used to mitigate hazards?

Table with Erik Cornellier as Scribe (Table 1)

1. Scientific basis for observation & assessment. NOAA provides quantitative information & data from which knowledge may be formed. Provides repository for national expertise.
2. Hazard mitigation – remotely-sensed elevation data needed to model categorical scenarios to predict storm surge (SLOSH).
3. NOAA is doing a better job of educating the public & local governments on what it does.
4. From advanced warnings (sever weather alerts) – built upon daily weather monitoring – to coastal resource management, ensuring safe navigation, etc.
5. Evacuation/mitigation preparations (not execution).
6. NOAA's services & products mitigate hazards by sharing critical information with several different user groups. Weather information assists with planning & preparedness.
7. Users of NOAA services must know how to use the data/information being provided.
8. In areas (communities) where NOAA's products & services base is understood and supported by local government, hazard preparation & response is most effective.

Table with Amy Holman as Scribe (Table 2)

1. Forecasts and warnings are provided via web, media, and directly to coastal and emergency managers.
2. NOAA Space Weather Forecasts are used for GPS and Electronic Transmission
3. NOAA Scientific Support Coordinators provide HAZMAT drift forecasts to the Coast Guard to mitigate oil and HAZMAT spills.
4. NOAA has access to LIDAR and multi-beam to map ports and coastal areas for hazard detection and bottom condition assessments both baseline and post storm. The issue is how to get this done quickly.
5. Water level, air gap, and currents from ports are used by ship's captains and pilots to make transit decisions.
6. PORTS provide data and forecasts of water levels and air gaps below bridges (web-based) for navigation.
7. Continuously Operating Reference Stations (CORS). Global Positioning System base stations.
8. Height modernization is used to support floodplain mapping and for determination of elevations to support hazard applications.
9. Height modernization technology is a tool that is critical to producing the best hazard mitigation maps to measure land height changes and coastal land and harbor management.
10. Properly integrated with other GIS-based technologies such as those employed by USGS, FEMA Flood Mapping Program and USDA agricultural measuring for modeling Height Modernization technology promotes interagency cooperation.

11. Precipitation type (rain, snow, ice) algorithms for staging snow/ice removal and road treatments.
12. Aircraft routing procedures in regard to winds, icing conditions (developed by FAA in collaboration with NOAA).
13. Marine hazard provider forecasts pf (?) areas of ship; steep waves, etc.

Table with Joana Gribko as Scribe (Table 3)

1. Real time information regarding water conditions in order for weather production to advise maritime interests so they can take appropriate actions.
   - Information on water conditions enables avoidance of hazardous conditions.
2. Storm ready program: encourages awareness and may foster mitigation in key sectors that NOAA consciously addresses, e.g. schools – critical care facilities.
3. Data (tide gauge, LIDAR, etc.) used in production of flood insurance studies and flood insurance rate maps which are in turn used on a community and property owner level.
4. Provide water level data to support coastal actions in support of manufacturing, navigation and evacuation.
5. Look for obstructions in waterways to clear them and open them up.
6. The NOAA Harmful Algae Bloom (HAB) Bulletin, which incorporates NOAA satellite data, provides real time and forecast information regarding FL red tide. One way that this information or product is used is that the commercial shellfish industry can plan. If the HAB bloom is forecasted to "hit" shellfish beds, the shellfish can be harvested early or moved to red-tide free areas as determined by local managers. This helps to ensure human health and safety as it protects from people consuming contaminated shellfish.
7. Raw data are entered into some state EM computers' GIS programs to identify vulnerable locations.
8. Physical oceanographic and surface weather observations and climatologues used to direct hazardous material spill response plans.
9. NWS/NHC hurricane information is used by FEMA for the hurricane program – a program that is used by state and local companies for evacuations during a hurricane. The hurricane parameters are also used in our HAZUS damage and economic loss model.
10. Insurance companies altering policies based on predictive tools – potentially influencing where people live.
11. FEMA uses NGS survey data in production of flood insurance rate maps.

Table with Tim Ross as Scribe (Table 4)

1. Tools to assess hazard risk for planning.
   a. Vulnerability assessment tools
   b. SLOSH models
   c. Evacuation zone maps
   d. NOAA/NGS CORS elevation programs
   e. StormReady program
   f. Hurrevac
2. Marine resources related monitoring.

3. Assessment and prediction.
4. Hydrographic services are used to help avoid shipping accidents, losses, and delays.
5. Weather prediction and forecasting is used to help decision makers and individuals move people out of harm's way, re-route goods to avoid delays, plan response and recovery efforts after a major event.
6. Understanding global climate change issues can be used to help decision makers plan for and mitigate the risks of sea level rises, for severe weather, etc.

Table with Ashley Chappell as Scribe (Table 5)

1. Plume tracking and predictive modeling.
2. Realtime assessment of hazard characteristics.
3. NOAA maps, observations and models are the basis for warnings and local responses.
4. NOAA provides part of base data and information used to inform local hazard mitigation efforts.
5. Helping the public respond appropriately to severe weather events, e.g. hurricanes, tornados, floods.
6. Predictions of storm events (acute weather).
7. Post-storm observations support post-event response and validation of models and assessments.
8. Collection and analysis of data feeds improved decision making.
9. Data, observation and modeling feed into:
    a. Long-term planning
    b. Acute response information (where NOAA is most effective)
    c. Response assistance post event
    d. Recovery – NOAA has some capability here, but least effective –needs more (e.g. What resources are at risk – good info)

Table with Terrence Lynch as Scribe (Table 6)

1. ENC – pre-event planning, post-event comparison, pre-event forecasting.
2. Event tracking - NWS website/forecasting and satellite images to support preparedness.
3. Port information: Real-time, tides, wages, current info to help mariner make safe, good decisions; raw environmental data is collected & processed to predict hazards.
4. Suite of tools is used inconsistently by user group and NOAA branch.
5. Summary: NEED FEDERAL CONSISTENCY. NOAA hazards mitigation tools are currently used inconsistently, a situation which could be improved by incorporating these tools into State enforceable costal policies.

Question 2. How can NOAA improve its information, training and tools to support hazard mitigation and resilience strategies for US coastal communities and commerce? What new tools and/or expertise are needed to make coastal communities and commerce more resilient to hazards?

Table with Erik Cornellier as Scribe (Table 1)

1. Coastal storm surge modeling accuracy and reliability.
2. Ensure hazard information can be disseminated in the widest means possible and in the timeliest manner possible through a variety of means. NOAA Weather Radio is great, but it is just a small tool. How does NOAA get this to everyone? Instant on TVs, radios, cell phones, etc.?
3. Develop processes to take NOAA's hazards, tools, and information dissemination capabilities and bring them to local communities to more effectively build resiliency to hazards – and then have the critical information needed to appropriately respond or recover.
4. Support & implement IOOS infrastructure.
5. Buoy systems.
6. Better synthesize existing data.
7. Improve NOAA's time to forecast & predict where hazards may/will arise. This enables communities to have greater lead time to prepare and thus be more resilient.
8. Increase education, training, and outreach.
9. Establish regional service centers (consolidated) for each region.
10. Familiarization training: NOAA personnel working/training with other agencies/groups to better understand possible threats and hazards. Familiarize with state and local potential hazards (i.e. flood-prone area – view a water rescue demo by local police marine unit).

Table with Amy Holman as Scribe (Table 2)

1. Develop advanced decision making and risk analysis tools and procedures including available (and to be available) information on the inevitable uncertainties in data, analysis, and forecasts.
2. Online Positioning User Service (OPUS) -- Web based automated GPS processing service.
3. LIDAR: Training on the use of LIDAR and research in more advanced LIDAR Applications.
4. Proceed with development of operational based HF radar for the determination of surface currents along the coastline of CONUS and HI.
5. Many states are funding measurements and maps within the 3 mile limit for fisheries habitat, beach erosion and replenishment, storm inundation mapping and "slosh" modeling, etc. NOAA should partner with states to help, advise and set data standards, share data from agency to agency.
6. Expand development and deployment of observational systems in support of environmental monitoring and prediction, e.g. land/space-based LIDAR, HR radar (e.g., determining height, ocean surface currents, ocean/atmospheric features.)
7. Better understanding of the information needs of the coastal and emergency managers and provide instruction on how to use the available information and tools so that the needs are met – or develop new tools/information that do meet their needs.
8. Provide HYCOM models for the North Pacific Ocean; to be used as inputs for HAZMAT and USCG Search and Rescue decision support tools.

9. Provide high resolution meteorology now and forecasts for Alaska and Alaskan waters; to be used as input for HAZMAT and USCG Search and Rescue decision support tools.
10. Invest significantly in assessments of societal and economic costs and impacts (including lost opportunities) of various hazards over a wide range of user communities – include coast/benefit analysis of hazard mitigation.
11. Run an Environmental Data Server (EDS) used by the USCG. The EDS makes a wide range of environmental data sources readily available for inputs into operational decision support tools.
12. Renew commitment* to satellite-based observing systems such that present capability will not be lost.
   * Several existing data streams from satellites will soon cease because no replacements are scheduled to be launched.
13. Increased funding for existing proven programs and expansion of programs nation-wide, e.g. Height Modernization. This is more urgent right now than innovation.
14. Develop and provide high resolution numerical models for the following areas: Boston Harbor, Long Beach/Los Angeles, San Francisco, Seattle, SE Alaska, to provide surface currents for NOAA HAZMAT and USCG Search and Rescue decision support tools.
15. Increase computer resources for operational and experimental weather/climate modeling systems – the US is way behind relative to virtually all other countries (e.g. Japan, China, Brazil).

Table with Joana Gribko as Scribe (Table 3)

1. Guarantee consistent, reliable standardized real-time information in an easily accessible format on a national basis. Provide all forecasts and physical data fields (weather and oceanographic) in open GIS formats.
2. NOAA could support the development of alternative storm surge models.
3. Improve or develop a type of ready score partner with insurance companies. A high score may lead to a lower insurance rate… legal nightmare, but something like this may galvanize mitigation and resilience strategies.
4. Provide a means to alert specific EM users/shippers/other specialized users when thresholds are reached for specific parameters: when water level increases exceed certain rates of change.
5. Confirm and clarify NOAA's role in DHS maritime recovery plan developments and activities.
6. Provide a Google map-like capability, but with selected NOAA observational parameters linked to "origin and destination".
7. Improve existing and use more graphics or animations that show a probable outcome from a particular hazard and/or mitigation strategy, e.g. probable coastal flooding from storm surge and how mitigation can limit damage.
8. Social marketing: advertising available tools that inform decision making as PSAs during primetime hours.
9. At the local and regional level, know what can work to better connect diverse stakeholders (coastal zone managers, economic development, the private sector, emergency managers, etc.) in planning so these key recovery elements can work together in the event of a disaster.

10. Spread the word about decision-support tools (the tools are only as good as the number of people who utilize them)
11. NOAA could increase rapid response teams to improve readiness.
12. By developing national integrated systems or networks to have comprehensive and uniform inputs from around the country, e.g. real-time water level and currents.

Table with Tim Ross as Scribe (Table 4)

1. NOAA should focus and define efforts and capabilities and not compete with or duplicate efforts of other agencies. The agency should include more focus on National Response Plan responsibilities.
2. NOAA should pilot a community resilience effort similar to Project IMPACT with associated funding to create models of success.
3. NOAA should lead the discussion nationally about resilience and try to bring federal, state and local decision makers and stakeholders together. (This was very important to all at the table. They want NOAA to show leadership.)

Table with Ashley Chappell as Scribe (Table 5)

1. Multi-sector [social, economic, public health, environment] "consequence" models – risk assessment tools and translation.
2. Train staff in NIMS and incident command.
3. What training does NOAA have now? Better advertising/education about what NOAA offers, because the table certainly did not know what NOAA provides in this arena as far as tools/services.
4. CZM – crossover between hazards and natural resource protection/economy
5. Improve on Storm Ready.
6. Boost Hazard Resilient Communities initiative.
7. Distill complex science into info understandable by varied users
   1. Tools and info required that inform long term decisions, reflect economic, environmental, social and public safety consequences of policy and decisions – thru comprehensive risk assessment.
8. Hold appropriate outreach training sessions.
9. Participate in regional training sessions, emergency planning activities.
10. Regional collaboration/training/outreach on target.
11. Digitize info for web access.
12. Publish data/info at greatest level of detail – high resolution.
    - Work with local/county/state and build up from there (integrated data sets).
13. Effectively translate science results into policy BEFORE a hazard event occurs, not in heat of moment.
14. Develop/maintain national standards because of issues that cross geog boundaries – good metadata.
15. Create hazard resilient ethic to inform communities for decision making – tool NOAA should definitely work on.
16. Integrate into community so people are aware of consequences.
17. Sustainability measures.

18. Deliver info in understandable formats – target public/local/policy makers and private sector – to change culture.
    - 2-way flow of info.
    - e.g., educating developer about how to build in resilient way – once implications are known, developer may change approach.
    - Local users need to buy in.
    - Research needs to address pressing issues at local level – ask users what they need.
19. Risk must be translated for multiple audiences – policy, public insurance, investment.
20. When data accuracy impacts life/property, people need to know good/bad about data they are basing decisions on – communicate uncertainty.
21. Risk assessment tool for slow onset event impacts (sea level rise, drought, climate impacts).
22. Communicate once you have better understanding – risk is not uni-dimensional (doesn't impact economy or environment exclusively – mixed impacts).
23. Define what the risk really is – translate for multiple audiences – to aid recovery
    - Incentivize/disincentivize behaviors.
    - Provide tools to see strategy/way forward.
24. Hold local governments accountable.
25. Science leads to knowledge that can be used by decision makers, ways for property owners to get value.
26. NOAA schizophrenic on CZM/resource protection – need to improve.
27. Integrated eco assessment has great potential.

Table with Terrence Lynch as Scribe (Table 6)

1. Event tracking – pre-event planning & resource allocation & distribution collected data for long-term environmental trends and planning
2. Improve forecast for extreme pop events, tornadoes:
    - Take full advantage wise spread dissemination tools, like cell phones, for warning dissemination
    - Use historical climate data and feed civil engineers information to increase resilience of infrastructure
4. Market analysis to determine to determine key audiences and most effective mechanisms to reach them with NOAA products
5. More collaboration with Federal agencies
6. Investigate and identify new dissemination methods
7. Use climate data to develop future natural hazard models
8. Develop economic valuations of ecosystem resources for use in planning (i.e. hazard, land-use.)
9. Summary: NOAA needs to assess the needs of specific audiences and create new mechanisms to effectively reach these audiences.

Question 3. What do external partners bring to the table that NOAA can leverage?

Table with Erik Cornellier as Scribe (Table 1)

1. Increased capacity.
2. Specific scientific expertise.
3. Vested local interest.
4. External partners bring requirements (for data) to NOAA which then gives NOAA the justification to continue/improve their services.
5. From the Coast Guard's perspective, it relates to our Search and Rescue mission. We provide the resources for saving lives, and in the case of the SARSAT system, this is all because of NOAA's satellites.
6. NOAA should maximize its use of existing state and local regional service outlets underwritten by other Federal agency partners (i.e., Regional Collaborations – NEPs, Great Water Bodies, Extension Services, Parks, etc.)

Table with Amy Holman as Scribe (Table 2)

1. Through JALBTEX, leverage airborne laser bathymetry capabilities of the US Navy, USGS, USACE, and NOAA to complete regular surveys of the US Coastline.
2. Other agencies (e.g. Navy and Air Force) can bring advanced atmosphere and ocean forecasting capability. Similarly, several foreign agencies (e.g. ECMWF, Meteo France) could bring advanced capabilities via suitably enhanced collaborative efforts.
3. External partners bring: shared advocacy, promote mutual buy-in, expands data exchange, knowledge-sharing, and lessons learned- greatly improves cost/benefit of federal dollars, promotes region-building.
4. Advocacy – Lobbying for developing constituencies and budget support for selected priorities (from this meeting). Ensure consistent message- PR, Marketing strategies (JTresl Tangible Benefits)
5. The Coast Guard has developed and Environmental Data Server that collects, archives, aggregates, and returns data cubes in NETCDF format to decision support tools. NOAA could use this for HAZMAT modeling.
6. NOAA should take advantage of and increased participation with industrial partners that bring state of the art equipment and data management systems and field experience as it moves toward its IOOS national capability.
7. Put emphasis on the development of IOOS and that development will answer this question, as it pertains to the coastal ocean.
8. NOAA brings operational models of meteorology and ocean forecasts that the Coast Guard collects via its EDS for use by its Search and Rescue Operational Planning System (SAROPS)
9. Local expertise in advanced application of LIDAR and Floodplain mapping
10. Participate in NOPP by finding the mechanism to engage in partnerships
11. NOAA and the USCG should work together to develop an oil spill/HAZMAT decision support tool that can be used by the USCG: a) ArcGIS environment, b) attached to EDS, c) simple for CG, full featured for NOAA

Table with Joana Gribko as Scribe (Table 3)

1. NOAA could compel states receiving CZMA grants to provide recovery plans for coastal communities and/or critical coastal ecosystems as a part of their CM plan approval process.
2. Collaborate with FEMA and USACE probabilistic surge modeling aid 1% stillwater levels across coast. (Helps FEMA with maps; USACE with coastal protection). A cost-effective approach, new planning tools to show where it is safer to build, etc.
3. Clarify roles of each stakeholder agency regarding activities such as water levels, navigational technologies, e-charts, etc.
4. Private sector brings business to business capabilities to critical community sectors, e.g. hospitals and coastal communities, transportation sectors. The private sector can develop tools that promote better decision making.
5. Can partner on post storm data collection e.g. high watermarks, and combined funding and field teams.
6. Local groups bring knowledge and understanding of community needs and a connection to the community.
7. Ensure that the best information possible is provided by USACE and the Coast Guard to NOAA charting and mapping, i.e. USACE should have the most up-to-date technology.
8. External partners can help NOAA privatize programs and actions for planning and budgeting purposes.
9. External partners bring constituencies that can test and adapt tools and extend the reach of NOAA's information resources.
10. NOAA could seek to discover uses for classified satellites and other data for hazard applications.
11. Digital flood insurance rate maps with boundaries and elevations data contained on them.
12. External FACAs engaged in similar NOAA FACA interests. Need to coordinate.

Table with Tim Ross as Scribe (Table 4)

1. Political clout and support – both intergovernmental and private sector
2. Can work with Google to distribute data and provide insight
3. Business community has lots of resources (satellites, aerial platforms for imagery, etc.)
4. NOAA should work with insurance industry and other business partners to protect critical coastal resources.
5. Local knowledge of needs and political influence.
6. Provide applications for other university research findings.
7. Environmental community/academic instructions could coordinate and share research with NOAA and vice versa.
8. Community resilience assessment tool.
9. Take advantage of messaging opportunities.
10. Develop partnerships! Work together to advance everyone's goals.
11. FEMA mitigation programs and expertise, including funding.

Table with Ashley Chappell as Scribe (Table 5)

1. Players: Insurance co's, for example, Fed/State/Local, Private Sector, NGOs, Int'l, Individuals. Emerging groups (post event, for example), Trade/Prof Assns
2. Partners bring the questions/problems
   - NOAA needs to check in and ask what THEY (partners) need to know
   - 2-way street
   - Here's what you might think about (from NOAA)
   - Here's what we are facing (external)
3. Established communication networks
   - Other agencies/Academia provide critical science/info that NOAA doesn't
   - Can challenge each other to do better/diff work
   - Different perspectives
   - Local knowledge of industry, business
4. Must be a way of sharing – insurance co, builders, academia
5. Environmental NGOs for budget support, advocacy (e.g. land trusts)
6. $, technical assistance
7. Policy formulation – all parties can have positive/negative impacts

Table with Terrence Lynch as Scribe (Table 6)

1. Partners bring scale, focus, implementation, integration, and knowledge
2. NOAA should focus on science
3. Access to local decision-makers & perspective to their needs
4. Industry partners can provide efficient implementation
5. Can develop new products based on underutilized NOAA data
6. Combine information into "real-time" fashion
7. Project mitigation funds to be used to provide infrastructure

Ecosystems

Overall Summaries

Summary 1

- NOAA should operate as a "user-driven" or "client-oriented" research and conservation organization; responsiveness to the stakeholders' requests for assistance will enhance the agency's value
  - Once per year, NOAA, along with EPA, US Fish & Wildlife Service, Army Corps of Engineers, states and local governments, industry, non-governmental organizations, and the public should hold public meetings in every region to report on (NOAA) progress with ecosystem approaches to management and to receive input from the public/stakeholders
- NOAA should implement existing agreements and laws and fund them *[the Stakeholder who held tight to this submission was referring largely to NOAA's support of AK Native co-management plans and to MMPA Section 119's umbrella agreement. Here's verbatim narrative this stakeholder provided: "...e.g., co management agreements that have infrastructure to enable communities to manage such as the Alaska Native Harbor Seal Co-Management Action Plan, which has not been fully, fully funded. Also, the Umbrella Agreement with the U.S. Fish & Wildlife Service, NOAA and the Indigenous People's Council for Marine Mammals calls for a yearly Summit—which isn't funded. This will bring more people to the table to make management decisions."]*
- Broaden knowledge base and knowledge transfer amongst international, native, industry components of the community, etc *[Verbatim stakeholder narrative is as follows: "realign the breadth of knowledge used to manage living marine resources. Applying an ecosystem approach to decide who should be in leadership councils should add reliance on native peoples, transportation, industry, international cases, etc. so all of their incentives are considered and weighed to evaluate costs and benefits."]*

Summary 2

Top 3 Needs:

1. Funding:
    a. to maintain/expand programs to help NOAA meet its missions (ex: on the ground restoration projects0
    b. for partnerships to help NOAA's missions and develop products for their clients/customers (without NOAA stovepipes) ex: Aleutian marine mammal commissions)

2. Training/Support
    a. to get through bureaucracy to make better partners

3. Tools:

a. Develop tools that would work effectively with uncertainty-that impact management decisions – (i.e. determine thresholds for levels of impact)

Question 1. How can NOAA improve the effectiveness of coastal science and management?

Table with Darlene Finch as Scribe

1. Participant 1
   - Integrate coastal science and management with living resource science and management
   - Increase public outreach and education, including awareness of endangered/critical/protected species and the natural habitat requirements of those species
   - Cooperation among local/state/federal government, across government agencies, and between government, NGOs, business, education and residents.
   - Incorporate key elements of coastal science and management into the national and state curriculum frameworks
   - Encourage collaborative research through a competitive grant program.
   - Encourage innovative management solutions at grassroots and local level through competitive grants program
   - Use technology/web-based solutions to share results, foster communication and collaboration ('myspace' type technology)
2. Participant 2 (Questions 1 and 2 combined)
   - Extend its jurisdiction or reach to include headwaters of anadromouos streams
   - Collaborate with local organizations (e.g., watershed councils) on baseline studies to answer locally defined issues/local initiative
   - Integrated data management with locally initiated projects and those in collaboration with other federal and state agencies
   - Factor negative externalities of development and uses into decision-making process. Requires incorporating ecosystem gooalds and services into analysis
   - Bioreserves
3. Participant 3 (Questions 1 and 2 combined)
   - More even assessment of the ecosystem (i.e., including protected species in data collection, total accounting for all catch and bycatch with observers, mapping of deep sea habitats, including corals)
   - Apply science to decisions more consistently and especially before beginning any new activity such as expending the scope of a fishery or beginning aquaculture.
   - Keep all the pieces of the ecosystem by ending overfishing, protecting habitat and vulnerable species, considering predator needs for forage fish
4. Participant 4
   - Partners with entities in coastal states in collecting and analyzing data
   - Fund coastal assessments by broader group of state resource agencies and public/private institutions
   - Provide greater access to data collected by NOAA and its contractors/grantees
   - Engage a broader audience in active decision making
   - Get information out in more timely and friendly manner

- Engage partners in research planning and setting priorities
- Engage public in fun activities to help them understand how their decisions affect coastal management
- Climate change is the biggest issue for coastal management – make it real for people by showing national leadership.

5. Wall charts
   - Must be able to consider inland areas (land/water)
   - To keep and understand all pieces of the ecosystems (not just single issues/species)
     - Balance and integrate all the pieces of the ecosystem
   - Risk Assessment for Ecosystems (parallels the National Academy's Risk Assessment for Humans(
   - Providing greater access to NOAA data. Make sure to include partners in the analysis and allow them to participate in the decision-making.
     - Increase education and outreach investment
     - Curriculum frameworks
     - Web and technology tools (e.g., MySpace)
     - Get information out in a timely fashion and make sure it is user friends and relevant to decisions that are being made.
   - Integrated data management both within NOAA and also within external entities (e.g., stranding database for marine mammals)
   - Better modeling for near-shore extreme weather events. Ned to make real for people (answer the question, So what?) and improve delivery.
   - Partnerships, partnerships, partnerships at all levels
   - Improving our understanding of the value of ecosystem goods and services.

Table with Margot Bohan as Scribe

1. NOAA should improve outreach and education, e.g., multimedia, web, video, videogames, satellite communication, etc.
2. NOAA should adopt user-driven (client/customer-oriented) management approach for conservation research, e.g., Gulf of Mexico LNGs
3. NOAA should apply ecosystem principles/approaches to large enterprises and information technology companies; ideally, application of these approaches will align common interest groups who will share same/similar incentives (and capacities) to comply and succeed
4. NOAA should address the results of the National Coastal Zone Management (CZM) Study to be completed at the end of this (07) year.
5. NOAA should foster broad meaningful public participation (this relates back to first bullet under this question); significant public education and outreach
6. Land management and water management should be linked
7. NOAA should include Alaska and American Native traditional ecological knowledge In decision-making processes affecting Alaska and/or American Natives; DOC has policy re: Native knowledge that should be reflected in NOAA policy and protocols. NOAA should also make the public aware that, under MMPA Section 119, Alaska Natives, in some cases, do have agreements with the Federal government to manage marine resources

8. NOAA should leverage existing regulations that can be adjusted to address coastal management, e.g., EPA's Run-Off Control Law (Total Maximum Daily Load (TMDL)) was the stakeholder's example of such leveraging
9. NOAA should put emphasis on producing more stakeholder-useable information

Table with Polly Endreny as Scribe

1. NOAA should:
2. 1. Better disseminate information about NOAA research, best practices, and accomplishments.
3. Better communicate NOAA's assets and abilities – need to "close the information loop" – and improve access to these assets.
4. Skill set of NOAA is capable of taking the lead in pressing issues; NOAA is uniquely situated to integrate data on sea level rise, land elevation, tides, storms, and habitat mapping to address issues of coastal inundation, upslope habitat migration, and wetland loss mitigation.
5. NOAA science has an undeserved, bad reputation, particularly NMFS and NWS. PR campaign?
6. Engage local communities more.
7. Address and help work on "Ridge-to-Reef" strategies (integrate coast and marine)
8. Create smart partnerships (i.e., lead scientific agencies and local communities) for sustainable solutions.
9. Have more frequent and regular meetings with other agencies/NGOs/etc. to share and discuss areas of collaboration (NOAA formerly met with other federal agencies, like the Dept. of Agriculture, on a weekly basis; but, these meetings have stopped for some reason). NOAA is not sharing as much as before; therefore, agencies and others are unaware of potential areas of collaboration. NOAA should compare coastal research with the EPA, USGS, NSF, Department of Agriculture, USDA, as well as NGOs and universities (academics).
   2. Collaborate with land-grant, agricultural universities on issues of storm water run-off (in both agricultural and urban areas).
10. Identify gaps with other agencies/NGOs/etc. and collaborate. Specifically, the long-term monitoring of waters should be an area of collaboration.
11. Communicate complex science to local land-use officials.
12. Improve communications within a region by establishing goals, participants, and times/meeting places for meetings to further integrate the efforts of various government agencies, commercial entities, and eco-aware local groups from the community.
13. Provide the technology for collaboration over resources that allow the collaboration (e.g., Internet-based, virtual meetings, web-based info).
14. Provide funding, particularly to NGO research.
15. Continue to build collaborative relationships with NGOs, local/regional government, academia, etc.
16. Serve as a nexus for academic/NGO coastal research.
17. Work on internal communication with NOAA regional and headquarter offices; additionally, communication outside of NOAA is very important.
18. Better public outreach; get information out to public regarding storm surges, etc.
19. Requirements of specifications for NOAA systems do not include collaboration tools, such as a central repository or web-based repository for information; absence of

collaboration with other entities (noted in specifications); absence of technology to support information (repository) and to send information to external entities.
20. Need systems to support efficient collaboration between entities, like web-based tools.
21. Use Internet2, a networking consortium, to communicate with universities and disseminate information to universities.

Table with Jen Faught as Scribe

1. Money-getting more and helping us find out how to get more
2. Mitigation-sharing ideas and resources so that everyone benefits; show the value of environmental work/projects
3. Comprehensive networks of marine reserves and utilize them for research monitoring and understanding of human impacts-there are very few no take reserves vs. studying impacted reserves
4. Distinguish between the watershed, beaches, inlets and offshore areas to better manage
5. Identify strategic needs
6. NOAA should provide products we need to do our job and help us with our customers
7. from a federal agency perspective: evaluate and communicate in a way that addresses the needs and mandates of other organizations
8. need to better integrate the actions of other organizations with NOAA's knowledge about science and management
9. partnerships to assist end users in a cost effective manner
10. collection of data to help partners
11. development of partnerships on the federal/regional/local and NGO level
12. Bi-directional partnerships (i.e. NOAA also as an end user ex: state of AK and local organizations providing informational data to NOAA to provide best management practices for the marine mammal commission)
13. Money (ex: RC more money for more restoration build better constituency to get more $)

Table with Shawn Arellano as Scribe

1. NOAA should leverage its dry & wet sides to make itself a leader in addressing climate change
2. NOAA should devote more of its funding for research to address NOAA priorities to universities in order to achieve more flexible, and cheaper science
3. NOAA should strive to educate coastal communities on the economic benefits of NOAA programs (ex: MPA & Sanctuary programs) to increase the effectiveness of science and management. This could be done by increasing funding to programs specifically for communication and education to communities.
4. NOAA should take a leadership role to develop and inventory of federal coastal science and management programs and create a federal ocean/coastal budget summary. There is a need to understand where federal dollars are spent.
5. NOAA should strengthen regional involvement and strive to get NOAA's most senior management involved at a regional level.

Table with Monika Thiele as Scribe

Stakeholder 1

1. Integrated Ecosystem Assessment
    a. Decision support systems
    b. Visualization and analysis tools
    c. Data sharing among partners
        i. Dynamic, web-based IEA
2. Invest in existing sub regional governance options
    a. NOAA line functions participate in regional processes

Stakeholder 2

1. Better integration of coastal management programs with other NOAA programs such as NMFS
2. Evaluate/understand cumulative impacts of coastal development and shore side activities on marine resources and habitat, including water quality
3. Better integration of land/ocean connection to improve ocean management
4. provide resources to states to inventory and prioritize intertidal and subtidal habitats that may be impacted by coastal development
5. Assist with development of educational/outreach programs to inform public about linkages between land-based and marine environment.

Stakeholder 3

1. By increasing research activities on coastal environment and management of a [illegible] economics and work with other groups and agencies.

Stakeholder 4

1. Increase communication, cooperation, and collaboration between NOAA offices and interested parties - academics, state, federal, NGOs, etc. Provide ops [operations?] for these groups to come together.
2. Share helpful management tools
    a. create library of management tools
3. Utilize basic research to help understand and evaluate resources and processes
4. Improve sustained observations (global to local).

Stakeholder 5

1. Get more international information out there – success stories from FMCs
2. international success stories look towards different fisheries in different areas
3. How is fisheries and climate change interrelated and getting out the message to how [it] effects food/fish on people's table.

4. Working with wetlands, upper watershed management and informing public interconnectedness
5. What is NOAA doing internationally to foster coastal science and management
6. International cooperation, collaboration
7. Sharing lessons internationally
8. Public awareness land/ocean/wetland connection and importance

Stakeholder 6

1. Aligning incentives for conservation should continue to be a NOAA priority
2. Fisheries opportunities are knocking now to have fully sustainable fisheries in the future.

Question 2. How can NOAA improve the effectiveness of living marine resource science and management?

Table with Darlene Finch as Scribe

1. Participant 1
   - Support the Marine Mammal Health and Stranding Response Program AND the John H. Prescott Rescue Assistant Grant Program – support and increase grant programs that accomplish NOAA goals innovatively and efficiently and involve actual stakeholders.
   - List to and support the people "on the ground", doing the work, make it easier for them, involve them in decision making.
   - When you 'think locally,' think not only geographically but subject-wise (e.g., people actually involved in local stranding response.
2. Participant 2 (See Question 1)
3. Participant 3 (See also Question 1)
   - Fishery independent data – increase the number of observers on fishery boats
   - Vessel monitoring systems – increase deep sea habitat mapping
   - Include estimate level
4. Participant 4
   - Engage partners in research planning and priority setting
   - Put species issues in context of broader impact on marine ecosystems
   - Get public to understand how their actions impact coastal and LMRs
   - NOAA has to show leadership in communicating impacts
   - Link climate change to how it will impact LMR
5. Wall charts
   - Engage partners in research planning and priority setting (job too big for NOAA alone)
   - Integrate LMR science and management with coastal science and management – is really an artificial divide
   - Collection, compile and distribute recommendations from the Stakeholder meeting
   - Increase the amount of fishery independent data, observers and vessel monitoring systems. Use all platforms to expand the scope of observations.

Table with Margot Bohan as Scribe

1. NOAA should conduct an international comparison of accomplishments, problems and issues with U.S. National CZM Study to leverage knowledge and experience, e.g., U.S. comparison with 9 Baltic Nations bordering the Baltic Sea
2. NOAA should include fishers' observations and real time observations from harvesters in their management scheme
3. NOAA should continue to fund community-based programs that include harvesters, e.g., biological sampling and archival projects
4. NOAA should incorporate into its management approach "user-specific management decisions to derive data quality objectives to create full line of sight" *(this is verbatim from the stakeholder; I didn't understand the point he was trying to make and tried to*

seek clarification from him and other people involved in ecosystem decision-making, but we failed to figure out what he was getting at—maybe PPI understands this(?))

5. NOAA should fund actual management efforts involving local, water-shed or regional implementation
6. NOAA should use web-based classrooms that bring ocean to students
7. NOAA should provide guidance to handle uncertainty as it pertains to resource changes and habitat shifts
8. NOAA should operationalize the precautionary approach when it comes to uncertainty
9. NOAA should "socialize" living marine resources in order to decrease dominant strength of private companies
10. NOAA should devote resources to experiment with different management regimes

Table with Polly Endreny as Scribe

NOAA should:
1. Reduce land run-off of pollutants into coastal areas.
2. Collaborate with Sea Grant, Land Grant, and Space Grant universities to better manage coastal and LMRs; integrating the focus of these universities into a whole approach.
3. Improve communication within NOAA and with external entities.
4. Integrate management of entire ecosystem; "ridge-to-reef".
5. More focus on ecosystem services: identifying, maximizing, and putting a value on them. Work with land grant universities on this.
6. Must join the Millennium Assessment (led by the World Resources Institute and in partner with the UN, the World Bank, and others). Chesapeake Bay conference on this in spring 2008 – NOAA should participate.
7. The regional approach seems to work, so please continue. It is logical that NOAA should continue with the lead/making headway.
8. Be sure to collaborate with different agency regions (many different regions mapped-out, but they should all be linked). NOAA, EPA, USDA, the Army Corps of Engineers, and the USGS all have their defined regions: How do they fit together? How can they be integrated? Is there a more effective way of working together? Communication is key, again!
9. Continue to focus on sustainable seafood.
10. Continue to provide funding (for example, to the Baltimore Aquarium).
11. Focus on strengthening collaborative relationships locally and regionally.
12. Strengthen public outreach as well as communication within and outside NOAA.
13. Improve communication with fishing industry (farming, water resource, etc.).
14. Integrate industry data into assessments.
15. Land/water interface, watershed management, connectivity issues are tied to LMR management. "Ecosystem management" goes beyond multi-species.

Table with Jen Faught as Scribe

1. We have trouble getting thresholds from NOAA to be able to determine when something is a low or moderate level impact and when we should be concerned-

context of significance-this would help us manage impacts more effectively and do our job more effectively

2. Need more quantification of things in order to make better decisions
3. Need more data to be able to make more effective management decisions
4. Develop tools that would work effectively with uncertainty (i.e. is this causing this?; climate change impacts)
5. A more integrated and dynamic management
6. NOAA reluctant to make definitive decisions
7. LMR inability to react fast enough within regulatory structures-is very restrictive
8. Adequate funding to carry things through which impacts continuity
9. Development of monitoring of current global change climate impacts for the short and long term-challenge may be no initial baseline
10. More strategic information for management decisions now vs. global climate change long term-are there not challenges now for AK for example?

Table with Shawn Arellano as Scribe

1. NOAA should increase research efforts and invest new resources on non-fish LMR's
2. NOAA should dedicate more efforts to the Caribbean region for both science and management. There is a need to understand economic & social of climate change and overfishing (for example). There is also a need to monitor ocean dynamics and interactions with weather and climate here.
3. NOAA should champion the development of a long-term biological time-series data set, in association with other ocean observing systems.
4. NOAA should increase resources for data management and sharing.
5. NOAA should increase support for marine biotechnology and other advanced technologies.
6. NOAA should make implementation of the MSRA a priority.
7. NOAA should dedicate funds to deep-sea coral research and technology program to use an ecosystem approach to management of this LMR. In addition to dedicating funds, the Deep sea coral R & T program should be identified as a budget line and actions should be coordinated with other agencies and programs both within and outside of NOAA.
8. NOAA should look at liability issues, especially in relation to reef conservation.
9. NOAA should focus on better habitat mapping.
10. NOAA should better coordinate activities within NOAA and between agencies. For example: four programs manage the endangered Hawaiian monk seal and a coordinated response is necessary for a dedicated intervention.

Table with Monika Thiele as Scribe

Stakeholder 1

2. Migrate from single species management to multi-species management/ecosystem management
   - look for multiple co-benefits

        i.   habitat
       ii.   water quality
     iii.   population dynamics/harvest
3. Invest in good science based stock assessment
4. Establish marine and estuarine protected areas
5. Assist with regional efforts to understand and map substrate and benthos resources

Stakeholder 2

1. Coordinate offshore surveys with nearshore surveys
2. Increase the spatial and temporal resolution of surveys of living marine resources
3. Support habitat mapping programs to identify priority areas for species management and protection.
4. Increase support for collaborative research
5. Provide research priorities and support research needed for stock assessment
6. Develop and adopt new assessment models for fisheries stock assessment
7. Reduce bureaucratic hurdles to conducting experiments on living marine resources
8. Improve timeliness of science /management process

Stakeholder 3

1. More research on living marine resource science from world activities. Build world cooperation on marine resource science
2. NOAA is only a small part of the overall problem and solutions
3. NOAA can provide leadership undeveloped countries on regional [issues?]

Stakeholder 4

1. Better data and more [data]
2. Share best practices and management tools
3. Engage research institutions to help NOAA solve its problems/answer most critical questions
4. Build large, strong regional consortiums guided by NOAA and Academies Research at center and forefront

Stakeholder 5

1. More international cooperation/collaboration
2. Transparency and sharing information at international level
3. Communicate how climate change affects fish at people's table
4. Adaptation to climate change needs and research with fisheries. etc, corals
5. Collaboration and cooperation with international stakeholders for marine resources

6. Work with import controls [to] ensure sust[ainment] of fish imports trade regulation
7. Ensure/support sust[ainable]/healthy imports [of] living marine resources
8. Ecosystem based approached also look at bioregionalization
9. Public awareness [of] Coastal Zone Management Act

Stakeholder 6

1. Align incentives for conservation
2. LAPP [limited access privilege program] = missing puzzle piece for good fisheries management and should be prioritized in the strategic approach for NOAA.
3. Based on Environmental Defense's evaluation of incentive based management of nearly 100 US fisheries :Sustaining Americas Fisheries"

Question 3. What mechanisms (e.g., research tools, regional partnerships, outreach) can NOAA use (or better use) to integrate its missions?

Table with Darlene Finch as Scribe

1. Participant 1
   - Integrated science database, web-based, technology tools
   - Use "keystone concepts" (like keystone species) to cross the stovepipes and integrate (e.g., marine mammal strandings have broad implications and relevance across NOAA programs areas. They are also very public events. By consistently support the Marine Mammal Health Stranding Response Program, and expanding the John H. Prescott Rescue Assistance grant programs, NOAA gets "the canary in the coal mine" – effective stranding response helps identify ocean issues and understand changes and trends in the ocean ecosystem. Incorporate awareness and involvement in stranding in the Ocean Service, the Weather Service , not only the Fisheries service
   - Non-cumbersome, user-friendly, relevant and modern technology and tools (again, think 'myspace', 'ebay' and other popular online sites and see if any have relevance)
2. Participant 2 (None)
3. Participant 3
   - Make publishing NOAA data and report automatic, not waiting for petitions from the public.
   - Assess sea turtle populations
   - Address deep sea coral conservation specifically instead of as a side project of other habitat or tropical corals
   - Exchange staff between different areas of the agency
4. Participant 4
   - Allocate funs across programs rather than line offices (i.e., align planning and allocation)

- Build a public constituency for the oceans and partners (and fund) other groups (NGOs, academic institutions, industry) to do same.

5. Wall Charts
   - Increase habitat mapping and synthesis of data. Increase usefulness of data
   - To identify and preserve very important (ecologically) high quality areas of the coastal and marine environment. This could help steer development decisions.
   - Align the planning and allocation functions in NOAA.
   - Make it easy for local stakeholders who need the information to make decisions
   - As NOAA develops, must be able to integrate into local efforts.
   - Use all the data that you have – use opportunities to collect as much data as you can
   - Foster collaboration while respecting ownership of data
   - Make most of data
   - Need close collaboration between climate, coastal and LMR folks
   - NOAA has to help lead the public to an improved understanding of how their actions impact resources. NOAA should be more forceful.
   - Need to consider concept of bioreserves
   - Requires local action and implementation. Need to have a regional/ecosystem view that pulls in local knowledge and activities. Local implies both a limited scale and a limited focus.
   - Make these issues fun for the public to engage in (education). Look to other creative ways to engage.
   - Don't forget to look at undisturbed systems. Keep some places pristine.

Table with Margot Bohan as Scribe

1. Every year in every region, NOAA should hold a public meeting in conjunction with EPA, states, non-governmental organizations, etc. inform the public about what has been done and how things are going (an annual status update) and to receive input/feedback
2. NOAA should implement existing agreements and fund them; co-management agreements have the infrastructure to enable the community to manage, but according to this Stakeholder the Alaska Harbor Seal Agreement Action Plan has not been funded and implementation of the MMPA Section 119 umbrella agreement will help bring more people to the table to help make management decisions
3. NOAA should support more (*technical?; capacity building?*) instruments to allow collaboration/cooperation in international waters/watersheds
4. NOAA should enhance its participation in interagency activities to better integrate and strengthen NOAA mission and to better discern existing weaknesses and problems
5. NOAA should conduct regional/local Town Hall meetings to obtain inputs on mechanisms that NOAA can use to better integrate/fulfill its mission
6. NOAA should use Essential Fish Habitat (EFH) policy to regulate man-based pollution
7. NOAA should advance methods to normalize valuations (worth) *(of what?)* and work to achieve restoration/conservation in accordance with these normalizations, e.g., at present commerce revenue can be in direct competition with risk mitigation, and

cultural integrity is, at times, in direct competition with cost-efficiency of private companies

8. NOAA should meaningfully involve communities, regional watershed groups, etc

Table with Polly Endreny as Scribe

NOAA should:
1. Focus on big picture integration.
2. Focus on clear communication, information sharing, and collaboration.
3. Reestablish the National Weather Service (NWS), at the local level, in rural areas of the US that the Department of Agriculture manages; better forecasts will be provided by the NWS (at the local level), which will help with crop management: it will reduce over-irrigation and subsequent pesticide/pollution run-off to coasts.
4. Establish a central repository or index of links to information.
5. Establish identity management certificates so people can trust who they are talking to; include external collaboration entities, such as government, in contract specifications as users (requirements).
6. NOAA should not try to micro-manage projects/programs. NOAA must trust the relationships they have established and let the researchers do their own micro-managing (not NOAA's position); NOAA should focus on the bigger picture. NOAA would free up resources for bigger picture work if they relaxed on micro-managing.
7. NOAA could help increase their trust by ensuring the appropriate, capable, and qualified people are responsible for certain tasks (there are implications with mis-assignment). Establish correct relationships with contractors/subcontractors – this eliminates the need to micro-manage. Trust those you have permitted to make the decisions – don't reassign the task again within NOAA and use up more resources, or change decisions.
8. Spend more time on prevention and the big picture. Land-based pollutants are responsible for many marine issues, for example. Work with land grant universities and land-based agencies on solutions.
9. Work on better public outreach.
10. Focus on fostering current collaborations instead of spreading too thin with new ones; work on smart partnerships.
11. Create models that include landscape ecology, linked habitats (marine to terrestrial), etc.
12. Get user-appropriate data to the communities (user-friendly, though sometimes people want the raw data). Data should be immediately applicable so the communities can use the knowledge to help with the issues in their areas.
13. Establish a NOAA-rooted search engine that searches across other agencies and organizations (like Google). Make it geo-spatially based. The regions could coordinate on the search engine (geo-spatial searches). This could lead to smarter partnerships for collaborations; areas of overlap will be shared, leading to obvious collaborations that should be established.

Table with Jen Faught as Scribe

1. Money!- Maintaining current level for continuity reasons and leveraging additional resources

2. What do our customers need? They need to be getting it from NOAA but not the "world according to NOAA" needs to be useful to us/our customers
3. Partnerships between federal government and other organizations-relevant and adaptive to regions/field staff-think outside the box/experimental
4. Utilize resources already there
5. Better way to work through bureaucracy in a timely manner-mechanism to make it better/more effective
6. Training/support to get through bureaucracy to insure better partnerships/management decisions
7. More effective buy in

Table with Shawn Arellano as Scribe

1. NOAA should take the stakeholder forum and implement it regularly at a regional level, taking care to include senior management and headquarter leadership. Integration should occur at a local/regional level.
2. NOAA should integrate ecosystem component data since various programs and line offices in NOAA and outside of NOAA work on different parts of the same ecosystem.
3. NOAA should build a data management system and dedicate funds to preserve old baseline data that is degrading.
4. NOAA should provide technical assistance to states and territories so they can participate in the "information conversation."
5. NOAA should focus on IOOS.
6. NOAA should understand the conflicts between users of the coastal zone. One way to do so would be to create a cross-agency GIS to understand human activities in the coastal zone. This could include information at the federal, state, and local levels.

Weather

Question 1. What are some of the possibilities NOAA should consider for observational systems (e.g., satellite, aircraft, buoy), high performance computing, and high resolution models to deliver improved hurricane track and intensity forecasts? How should NOAA balance investments in these key areas?

(Mike Gerber as Scribe)

Priorities (not in any particular order) established at end of session

1. The future is hi-res coupled global modeling. Implement as soon as cost effective.
2. Challenge of partnering and cost sharing things of mutual benefit. Communication is key.
3. Cost/benefit and risks should determine expenditure choices for observations, systems, research, models, and human factors (e.g., risk for airplanes)
4. Need good real time 3D coverage of winds and near surface ocean conditions for hurricane research, models, and forecasts.
5. Re-align policies/practices to maximize benefits as capabilities grow
6. Need to replace lost coverage of data such as Quickscat.

Notes taken during session

1. Need to consider cost/benefits, but difficult to do because costs aren't known to partners
2. Look to do things that provide value without cost
3. Watch/Warning lead time doesn't make sense. It should be based on the event, such as Katrina, where people were evacuating before watch/warning in effect
4. Would it make sense to leverage a simulation?
5. Initialization of models is important (detailed observations needed to better understand heat transfer – I think that was the message)
   - Non-operational technology exists, such as placing equipment on surface waves
   - High winds are not well understood. Good aerial coverage of wind is necessary.
   - Options include doing such a large quantity of observations that you are likely to hit the target and/or doing it for select storms.
6. Does the tail Doppler on the G4 duplicate the efforts of the P3 airplane?
   - NOAA commented that having more Doppler is better for purposes of time coverage and adds little weight to the plane with little impact on the flight
7. The loss of Quickscat will result in a loss of data assets and how do you deal with that?
   - Quickscat is beyond its planned use
   - It takes 10 years to spin up another satellite
   - Feel this is a major issue
8. Better exchange/communication needed between researcher and forecaster such as VTC between offices

9. Mention of hurricanes going over warm core regions
   - GHSS high spectral sounding mentioned as scheduled for GOES-R
10. NOAA is not transparent in cost/benefit regarding the human assets for P3 and G4 missions.
    - Argument made that loss of plane/crew would be damaging to NOAA
    - NOAA commented that Safety is #1 and no plane has been lost yet
    - Risk is never zero
    - Argument made by another participant that maybe NOAA should take more risk
    - Some would like to fly into the boundary layer
11. Cost sharing from affected communities (e.g., via other agencies, governments, grants, etc) needs to be tried. The challenge is how you prove the community is affected.
12. Space based Doppler was brought up
13. How do you determine if observations are useful?
    - 3D winds and Upper Ocean are deficient
14. Hi-res computing
    - NOAA says speed and capacity are the biggest issues, especially when you are talking about ensembles
    - SATCOM modems too slow (NOAA agreed this is big issue)
15. There are model-forecaster challenges
    - Decisions support is needed
16. NOAA says global models are the wave of the future
    - Stakeholder says NOAA should spend time getting ready until the cost is right to run hi-res models
17. This is not just a meteorology problem, but also an ocean problem
    - Coupled models are necessary

Question 2. What are some of the possibilities NOAA should consider for observational systems (e.g. dual pol and phased array radars, wind profilers) and information technology to display, compute and communicate improved severe thunderstorm forecasts?

(John Sokich as Scribe)

Observations

1. NOAA should develop a vision/framework to network the diverse observation systems (radars, surface observations, etc.) to meet the needs of its users. (Comment was made about the NOAA Observation Council and this was the right place to accomplish this)
2. Need to be able to assimilate all data for:
   - Visualization
   - Modeling
   - Presentation
3. Facilitate and prioritize research to meet the needs and the vision

4. NOAA should play a leadership role in the multi-agency Phased Array Radar research effort to ensure the PAR is effective for radar e.g., tracking aircraft is a known capability and technology.
5. NOAA should fund Dual Polarametric/Phased Array Research **_NOW_**
6. **NOAA Research efforts should determine the optimal mix of large and small radars to fill temporal and special gaps (CASA type systems)**
   - Portable radar testbed needs to be part of evaluation)
7. Research on the optimal mix of observing systems must be done now, especially Phased Array and gap-filling radars, but needs to include all observing systems -- radar (PAR, gap fillers, profilers), satellite sounding systems, UAV, balloons, mesonets, aircraft, etc.
8. Federal effort for Phased Array Radar should be a joint effort – DOT, DOD, DOC – to ensure large base of support for the program
9. Impacts of new observations and information need to be included into decision support systems.
10. NOAA should develop a vision/framework to network the diverse observation systems (radars, surface observations, etc.) to meet the needs of its users. (Comment was made about the NOAA Observation Council and this was the right place to accomplish this)

Communicating warning information:

1. Clearer communication of warnings/.forecasts is needed (needs to be cleaner and more "English")
2. Clearer Web presentation
3. Consistency across NOAA (in particular NWS Hydrology) Web pages
4. GIS is critical
5. NOAA Weblinks and pages need to be updated
6. NOAA needs a graphics clearing house for image capture (for easy use to download and insert into presentations)
7. One stop shop for related information
8. Better NOAA search engine – current one only points to articles and old ones at that!!
9. CAP (Common Alert Protocol) compliant warnings
10. Web Based "push" warnings, based on location request.

Written question

NOAA Research, as national and world reader in meteorology, is a key enabler of NOAA's vision for the future. Do NOAA's budget priorities support this, in light of operational pressures?

Question 3. What are the most significant emerging societal demands for water resource information services, and what is NOAA's distinct role in responding to those demands?

(Curtis Carey as Scribe)

Top Items

1. Provide GIS compatible data feeds.
2. Increase availability of probabilistic forecasts for decision makers.
3. Expand inundation mapping services with GIS overlay.
4. Provide drought data and forecasts: Long and short term water resource information and projections

Notes Pages

1. Decision makers need best decision support services. AHPS is a great example.
   - Need GIS-based tools that provide more knowledge of potential human impacts
   - Need to gage customer needs better.
2. Increased availability of GIS data, not just static products. Need more manipulatable data feeds.
3. Ice Flows: Improved visual ice monitoring network. Need satellite images or webcam visual references of ice flows.
4. Need high resolution satellite imagery of rivers and flood zones available and advertised to stakeholders.
5. Need for probabilistic water and drought forecasts (near and long-term).
   - Especially needed for AHPS
6. Expand inundation mapping, tied with GIS overlay
7. Digital elevation mapping - The goal is to create a one-stop shopping service for decision makers rather than having them pull data and graphics from several different sources.
8. 70,000 volunteers: get them to understand what "10 feet of water" means to a given location. Need visuals to provide important references as to risk at a particular site. What is the impact on people and farmland at that site?
9. Local knowledge is being lost because of an increasingly transient society. Critical to systematically capture and convey the risk for a particular site. This is important to educate those who are at risk but don't have local knowledge.
10. AHPS ensure reliability and performance are standardized across all RFCs.
11. Agricultural sector needs new tools to measure drought impacts
    - Soil moisture data
    - Water table trends (departure from normal)
    - Precipitation departures
    - Coupled wx climate models
    - CPC drought outlook does not cover all of the needs. Need short-term global drought outlook that can be localized. It must be an objective product.
12. NOAA needs to better understand and quantify the impact of the drought measures on stakeholder decision support.
13. There are two ways graphical products are currently portrayed—county level by the RFCs and national level by HPC. The different stakeholders have different needs so having the data in two different incompatible formats is problematic.
    - These should be standardized in a true GIS compatible database. It allows stakeholders to customize the data to their unique needs.
14. Individual RFC web pages are good. But it is a time-consuming process for customers who have to look at multiple web pages because their interests cover a larger area.

15. Need Timescales added to precipitation forecasts. E.g. 1.5 inches of rain over next 36 hours. Time scales are important for agricultural interests.
16. Need to integrate observation networks in a common portal and format
    - Create a one-stop shopping portal for all observations
    - Take advantage of satellite overlay imagery. Integrate visual information and data. An example is the use of Google Earth overlayed with tornado warnings. NWS's Ridge Radar is a similar example.

Question 4. What products should NOAA focus on in support of the Next Generation Air Transportation System (NGATS)?

(Monica Montague as Scribe)

1. *[Participants defined products to equal data]*
   - Shift from products to data
   - Increase the priority of NOAA's commitment to aviation support mission
   - Research to operations
   - Aviation coordination between NOAA and FAA and expand beyond to coordination between NOAA and JPDO, etc.
2. Role of automation and humans to support weather needs of Next Gen
   - NOAA needs to develop a process to continually evaluate the role of the human forecaster in Next Gen automation
3. Product application role
   - What is the right size observation network?
   - NOAA need to right size observation network
4. NOAA should take the lead in developing an optimal aviation system
5. Need phased array
6. NOAA and NASA can help with data assimilation
7. International cooperation should also occur
8. **4 D Cube must**
   - Be updated
   - Have high resolution
   - Have a joint requirements document
   - user must understand what data is to make good decisions
   - Have capability-oriented requirements
   - Be probabilistic
   - Be tailored to user
   - Provide seamless transition between global and terminal (airport) scales so customer can extract what they need
   - Have time-staged requirements
   - Have a deadline to do something
   - It is OK to have unmet requirements
   - Use spiral development model to add capabilities available today and needed in the future
   - Have an aggressive training process in place to support initiatives innumerate here

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9. **Automation/Human**
   - System and performance needs to be monitored
   - User integration of weather information into traffic tools like
   - NOAA, JPDO, NASA take a leading role \
   - NOAA take role of providing information consistency for Next Gen
   - Provide support to the single authoritative source within Next Gen 4D Cube
   - Establishing framework and data exchange model
10. **Change Management**
    - How to transition away from legacy products and support users
    - Short-term and medium –term efforts need more structure
    - More rigorous change management structure for short-term accomplishments to build on the long-term
      - Not certain what NOAA's role is in this
      - NOAA must have a role in change management
    - Short-term accomplishments must be built upon to get to end-state
    - Must rally the troop first to get to end-state
      - Buy-in
    - No one group can do it all
    - Must be a willingness to accept, address and overcome cultural resistance to change
    - Empower organization to take charge of change management
    - Need performance metrics to validate that customer needs are being met
    - Everything needs to be Geo-referenced to be applicable to cockpit, etc. k. Information needs to be in a format customer can use
    - This requires resources
    - Customers need adequate lead-time to format changes
    - E.g., one year for major changes
11. **Summary:** Aggressively embrace NOAA's commitment to NextGen
    - Create and maintain the "4D Cube"[4-dimensional representation of the atmosphere; weather information for the aviation system], including observation network and data assimilation
    - Establish the single authoritative source for aviation weather support
    - Responsible for continual evolution of automation and human mix
    - Embrace and implement change management
    - Establish metrics and invest in training
    - Secure resources to implement
12. Additional Stakeholder input provided on index card

    1. NOAA/NWS,
       Southwest Airlines views our relationship with the NWS as a key part of our business. Please keep up the good work. I believe that the state of the National Airspace System (NAS) is in dire need of an integrated approach between the NWS + FAA. We have CCFP, NCWF, ITWS, CIWS, CWSU meteorologists, etc. We do not see a good and productive relationship between NWS + FAA. The NWS are the weather experts + in my opinion need to take "charge" of aviation wx [weather]. This could be started by indicating as a key identified goal of NWS/NOAA is to increase its working relationship with the FAA to

research, develop + implement improved weather information into the NAS + terminal weather environments.

Thanks,
Rick Curtis, Southwest Airlines
Rick.Curtis@wnco.com

Question 5. How should NOAA respond to new mandates at local, state, and national levels to address integrated climate-air quality management strategies?

(Donna Franklin as Scribe)

Moderator: James Meagher, Program Manager, NOAA Air Quality Program
Participants: Linda Miller, Earl Waesche; John Petheran; Shelton Swainer;

1. In particular, ethanol creates problems for the boating industry because the fuel causes mechanical problems for boat engines. Boaters will go to extremes to avoid using ethanol. Policy makers should ensure they include inputs from all stakeholders, including the business community, before making policies that will have widespread impacts. **Recommendation: NOAA needs encourage policy makers to look at *all* impacts of alternative fuels, including how they impact different industries (e.g., boating/marine industry).**
2. Because NASA has the capability and resources to launch satellites that could support NOAA research, NOAA should actively support funding for NASA. NOAA should work with NASA to collaborate on research when appropriate. **Recommendation: Vigorously pursue opportunities for space-borne observation platforms to support air quality-climate research. In particular, NOAA should support NASA's GEO-CAPE program.**

3. Air quality data are currently difficult for the private and non profit sectors to obtain because state and national government agencies do not use a consistent data format. To effectively use the data, the government must provide it to the private/non profit sectors in a format that easily accessible, useful and standardized in format. The best vehicle for providing the information would be NOAA Port. **Recommendation: Make air quality data available in a useful, standardized format to users; use NOAA Port to disseminate data.**
4. The federal government needs to better coordinate efforts in air quality data and determine which data can be standardized and made available to the private/non profit sectors. This decision must be made with stakeholders in the appropriate sectors. **Recommendation: Form a team (to include EPA, NOAA and stakeholders) to determine which air quality data should/could be standardized and disseminated via NOAA Port**
5. Too often government agencies work in isolation and fail to recognize the impacts their activities may have on other sectors or countries. Activities and programs must be designed with a more thought on how other elements, programs, and populations will be impacted. This is especially true in areas of climate change and air quality. **Recommendation: Ensure that NOAA's research and activities regarding air**

quality and climate have a global perspective; work with international community on efforts.

6. Sometimes the findings of scientists and researchers are not effectively communicated to policy makers, even though the information could have a significant impact on policy decisions. NOAA needs to be proactive in publicizing their scientific findings. **Recommendation: Work to ensure that all NOAA's air quality research results are included in global warming/climate discussions and actions within the Federal government.**

7. The public is largely unaware of the significant impacts of climate change and air quality. It takes a concentrated, coordinated, long term effort to educate the public and change behavior. A well-informed public can help create important policy changes that will impact the environment, but they have to know the issues and have a role in identifying challenges and solutions. NOAA can have a huge impact in increasing public awareness of the environmental issues that face the Nation. **Recommendation: Initiate public education and outreach effort to effectively describe the impacts of air quality/climate issues.**

Climate

Question 1. What are the most significant emerging societal demands for climate information?

Table with Margaret Fowke as Scribe (GREEN)

1. Observations merge into real data—find best available technology
2. Some type of reliable index indicator or multiple indicators (one dot)
3. Not communicating how important NOAA is and selling to politicians
4. Budgets—fighting for dollars (three dots)
5. Coastal Hazards Resilience, Integrated ecosystem assessment, weather/water forecasts & climate
6. Water-(a) availability and precipitation (b) fire – wildland fire, temp, energy use based on increased heat, energy use and emissions (one dot)
7. Risk management, tolerance/intolerance assessment of risk based on economic impacts, societal demand such as health & employment
8. Societal needs –nuances investment in climate sciences
9. Need long term observations and threshold for understanding climate science and value (three dots)
10. Does individual watching 5:00 news understand?
11. Bifurcate climate and global warming as important but don't lose underpinnings to navigate future
12. Current events without data interest groups will push global warming issues, observations are the foundation (one dot)
13. All climate change is local.
14. Public education so they understand global warming is real; perception of global warming impacts and inaction. (Two dots)
15. Truth as societal demand (i.e., current administration is subverting their decisions vs. convenient excuse)
    States are moving ahead despite Federal government.

Table with Rachel O'Malley as Scribe (BLACK)

1. Objective science to answer the question: "What is happening to our climate?" *1 vote*
2. Objective interpretations of scientific conclusions *1 vote*
3. Knowing who to listen to re: climate change and impacts *2 votes*
4. Predicting long-term weather patterns (10-30 year time horizon) in various regions of the United States
5. Predicting the impacts of climate change on energy/food supplies in various regions of the United States
6. Predicting economic impacts of climate change in various regions of the United States *1 vote*
7. Local/State/Regional Needs (e.g., economic development, disaster planning, health planning, natural resource planning, mitigation, education, communication, coordination with the federal government) *2 votes*

8. Business Needs (e.g., investment, resource allocation, education/communication with stakeholders, addressing the regulatory burden)
9. Scientific Needs: consistent data format and meta data so that information can be shared by government agencies, with the private sector, and internationally *2 votes*

Table with Nicole Morris as Scribe (RED)

1. Regionalized/localized mid-term (3 to 10 years) forecasting
2. What is going to happen "here"?
   - Local, Regional, Watershed, National assessment (tourism sectors, public health sectors)
3. Easy and efficient access to climate information
   - Historical, Current, Projection
4. "One Voice" speaking the truth about the climate
   - Too many people
   - Avoid inconsistent voices
5. Education and climate literacy at the heart of all these efforts
   - For all audiences: students (all ages), general public, Decision-makers
6. IPCC probability windows- highly uncertain, less uncertain
   - Alternative to "truth"
   - References to "One Voice" thought
7. Effective data fusion
   - Accurate meaningful merging of data sets
   - "GEOSS" idea
8. Provide meaningful access to data
   - Provide opportunities for students and public to explore data

Table with Patricia Huff as Scribe (BLUE)

1. Documentation of existing and future climate change trends by timeframe (ex. annual decadal study) location and scale. (#1 most voted response to this question)
2. Changes in snow level elevations
3. Observation capability of NOAA of concentration of green house gases (#3 most voted response to this question)
4. Information to develop mitigation strategy (ex: data use in coping mechanisms or drought trigger)
5. Want NOAA to be a steward, referee, facilitator of place-based climate trends (#2 most voted response to this question)

Neil Christerson Summary

1. "What's going to happen where I am now?"
   - Local
   - Regional (localized mid-term (3-10 yr) forecasting)
   - Watershed
   - National Assessment

2. Easy and efficient access to climate information – historical, current, and projections.
3. Effective data fusion – accurate and meaningful merging of data sets – "GEOSS idea".
4. Education and climate literacy are at the heart of all of these efforts for:
   - Students
   - General public
   - Decision-makers
5. There is uncertainty in knowing who to listen to regarding climate change and impacts.
6. Local, state, and regional needs:
   - Economic development
   - Disaster planning
   - Health planning
   - Resource planning
   - Mitigation planning
   - Education and communication
   - Coordination with federal government
7. Scientific needs – consistent data format and metadata.
8. Budgets – fighting for money
9. Societal needs – long term observations and threshold for understanding climate service and value.
10. Risk management – tolerance/intolerance assessment of risk based on economic impact, demand, health.
11. Documentation of existing climate change trends and future directions by time frame, location, and scale.
12. Want NOAA to be steward/referee/facilitator of place-based climate trends.
13. Capability to observe the concentration of greenhouse gases.

Question 2. What are the most important products/services NOAA is providing in support of these demands?

Table with Margaret Fowke as Scribe (GREEN)

1. Vulnerability assessments of any resource to climate change (four dots)
2. List of options for adaptation. (one dot)
3. OAR climate funded program from global to coastal observations (i.e., connect ocean observations to global observations) (five dots)
4. Climate reference network; current climate quality & sets the reference upon which everything else is measured.
5. Better integration of data (two dots)

Table with Rachel O'Malley as Scribe (BLACK)

1. Long-term data stewardship (e.g., through programs like CLASS, IOOS) 3 *votes*
2. Diverse observation data (e.g., from satellites, surface observing, *in situ*, etc.) *3 votes*
3. Climate science (e.g., modeling, assessments) *4 votes*
4. Forecast products (e.g., drought information such as NDIS) 2 *votes*

Table with Nicole Morris as Scribe (RED)

1. Spearheaded a creation of climate literacy standards for education
   - In collaboration with the National Science Foundation
2. Efficient database for all United States climate records with free and open access
3. Provides routine operational, seasonal and interannual forecasts and accuracy of these forecasts
   - Temperature
   - Precipitation
4. Regional Integrated Sciences and Assessments (RISA) and Transition of Research Applications to Climate Services (TRACS)
5. Funded and encouraged climate scientists to conduct research and speak openly without censorship
6. NOAA funded research provides substantial percentage of IPCC results
   - Contributions to IPCC

Table with Patricia Huff as Scribe (BLUE)

1. Defining climate observing systems (#2 most voted response to this question)
2. Support for the use of data (i.e., stewardship)
3. Climate database provided by NCDC (#1 most voted response to this question)
4. Free access to data and products
5. Support for independent research and peer review studies (#3 most voted response to this question)
6. Collect and quality control observational data

Neil Christerson Summary

1. Data acquisition, assimilation, distribution, and stewardship (e.g., NCDC)
2. Support for research and analysis.
3. Outreach and education, e.g., climate literacy standards.
4. Open data – dialogue without censorship.
5. Participation in climate policy and programs, e.g., IPCC.

Question 3. What should NOAA be doing new or different in response to these demands?

Table with Margaret Fowke as Scribe (GREEN)

1. NOAA doesn't know how to mind their own data to turn information that a larger user can work towards—too stovepiped.
2. Bridge between socioeconomic impact and scientific community. (one dot)
3. Formal integration of management plans and observation systems into corresponding comprehensive science plan
   - Observations
   - Management

- Science
- All above should line up in one document (Five dots)
4. Need to establish business case and cost these above items out
5. Good foundation based on successful models-government research and private models
6. Not losing direct national data and outsourcing to China (one dot)
7. Public sector funding where there is viable companies who can fund or RFP?
8. Need a public sector interface czar and we need public section
9. Need cooperative research and development agreements—Department of Defense and others use so why not NOAA?
10. Coupling ocean and land observations. (two dots)
11. Continuing observations—evaluate with respect to resolution and scale. Can you downscale the model using data and get local impacts? For example, in the NPS when we read assessment for a region it does not make sense
12. Federal initiative guided/directed by science, in service to end users(one dot)
13. Accessible and menu driven by those with authority to do something with it.

Table with Rachel O'Malley as Scribe (BLACK)

1. Set standards for data quality *1 vote*
2. Identify and fill gaps in observation sources *2 votes*
3. Invest, invest, invest
4. Do a better job of seeking necessary budget resources from Congress
5. Work toward inter-agency adoption of standardized data sets and standard Meta data *2 votes*
6. Make a better case for the role NOAA plays (brag!); increase NOAA's profile through more outreach to the public, in order to promote widespread recognition of NOAA goods and services *4 votes*
7. Tap into existing outreach efforts (e.g. USDA Cooperative Extension Program)
8. Consider as a model the USDA's Non-Point Source Pollution Education Program for municipal officials (an effective local training program that achieves significant results on a very limited budget)
9. Partner with other agencies and the private sector to stretch available resources *2 votes*

Table with Nicole Morris as Scribe (RED)

1. Be more proactive
   - Articulating short/long term impacts of projected changes
   - Interpreting
   - For audiences: general public, students, decision-makers
2. Importance of 10 year horizon as a reference point for projections
3. Support more free and uncensored communication/dissemination of research and results in a timely fashion
4. Support more free/uncensored research
5. Actively engage with specialists in public communication about climate science
6. Actively engage the public in designing and implementing research planning and research (community based research)

7. Get more money
8. Lead/coordinate all United States government agencies on climate issues versus trying to do it all
9. Prepare the infrastructure necessary for archival, access, reanalysis of climate data sets from many emerging data sources
10. Note card Comment: NOAA could improve in collaborating with industry and international partners in a non-competitive nature. (Bryce Ford)

Table with Patricia Huff as Scribe (BLUE)

1. Show me the money ($$$) – Better match their budget requests with societal demands (tied #1 most voted response to this question)
2. Talk/listen/develop (input from user community is very valuable) more relevant products (essentially give the people what they want/need) (tied #1 most voted response to this question)
3. Observations relevant to carbon (C) and (GHG) sources and sinks (#2 most voted response to this question)

Neil Christerson Summary

1. Integrated observations/management/science plans should all be in one document.
2. Federal initiatives directed from science in service to end users.
3. Coupling ocean and land observations:
4. Evaluate with respect to resolution and scale;
5. Downscale to get local and regional impacts.
6. Make a better case for the role NOAA plays in the climate debate (brag!).
7. Interagency adoption of standardized data sets and standard metadata.
8. Partner, partner, partner with other organizations/agencies at all levels (international, national, state, local).
9. Identify and fill gaps in observation sources.
10. Show me the money – better match budget request with societal demands.
11. Develop more relevant products – give the people what they need.
12. Observations relevant to carbon and greenhouse gases sources and sinks.
13. NOAA should lead/coordinate all U.S. Government agencies on climate issues versus trying to do it all themselves.
14. Prepare infrastructure necessary for archival access, reanalysis of climate data sets from many sources.
15. Actively engage the public in designing/implementing community-based planning and research.
16. Be more proactive
17. Articulate long term and short term impacts
18. Interpret for the public, students, and decision-makers.